

A NEW SPECIES OF *SIBOPATHES*
(CNIDARIA: ANTHOZOA: ANTIPATHARIA: ANTIPATHIDAE)
FROM THE GULF OF MEXICO

Dennis M. Opresko

Abstract. — A new species of antipatharian (Cnidaria: Anthozoa: Antipatharia), *Sibopathes macrospina*, is described from the Gulf of Mexico. The species differs from the only other species in the genus, *S. gephura* van Pesch, by having longer spines and anterior pinnules positioned slightly above, rather than below, the adjacent lateral pinnules. The taxonomic relationships of *Sibopathes* with *Cladopathes*, *Hexapathes*, *Taxipathes*, *Bathypathes*, *Schizopathes*, and *Parantipathes* are discussed.

An unusual antipatharian coral was recently collected in the northern Gulf of Mexico during submersible investigations conducted by Dauphin Island Sea Lab under the direction of T. Hopkins. This coral proved to be related to a species in the genus *Sibopathes* previously known only from the Indo-Pacific. Comparisons with the type material of the Pacific species have revealed that the Gulf specimen represents a new species. The holotype has been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

Family Antipathidae

Subfamily Cladopathinae

Genus *Sibopathes* van Pesch, 1914

Type species. — *Sibopathes gephura* van Pesch, 1914:203–205, pl. VI, figs. 3, 5–6, 15; pl. VII, fig. 3. (Type locality: Indo-Pacific, east of Timor, Indonesia, 8°17.4'S, 127°30.7'E, 1224 m, *Siboga* Stn. 280).

Diagnosis. — Polyps transversely elongated with six reduced primary mesenteries, no secondary mesenteries, and no actinopharynx.

Sibopathes macrospina, new species

Figs. 1, 2, 3, 4A–C, E

Holotype. — USNM 91417. Gulf of Mexico, off Alabama, 29°09'30"N, 88°01'10"W,

UNCW 9119, *Johnson Sea Link* Stn. JSL 3097, 26 Aug 1991, 489–559 m, Coll. W. W. Schroeder.

Diagnosis. — Corallum branched and pinnulate (Fig. 1); pinnules simple, 1–2 cm long, arranged in four longitudinal rows and grouped in alternating pairs with each pair consisting of one lateral and one anterolateral pinnule (Fig. 2A, B). Spines simple, triangular, smooth, 0.07–0.12 mm in height (Fig. 3); arranged in longitudinal rows; from four to six spines per millimeter in each row. Polyps elongated, about 2 mm in transverse diameter (Fig. 4A); in a single row with four polyps per centimeter.

Description. — Holotype about 36 cm high and 16 cm wide (Fig. 1). Basal holdfast absent; lowermost part of the stem about 2 mm in diameter. Corallum branched irregularly to the fourth order with branches 0.5–2.0 cm apart. Branches and branchlets straight or curved, and directed upward (branch angle 60–75°). Overall branching of corallum planar with branchlets arising primarily from sides of lower order branches, occasionally from front (corresponding to polyp-bearing side of stem) and rarely from back.

Stem and branches pinnulated; branchlets developing from elongated pinnules which become pinnulated in turn. Pinnules simple (without subpinnules), relatively straight and stiff; not strictly uniform in size,



Fig. 1. *Sibopathes macrospina*. Holotype, USNM 91417; height about 36 cm.

number, or arrangement on branchlets but usually in four longitudinal rows with two nearly opposite lateral or posterolateral rows and two anterolateral rows (Fig. 2A). Anterolaterals occasionally located more lat-

erally and laterals more posterolaterally. Anterolaterals absent near base of some branchlets. Pinnules 1.8–3.5 mm apart (mean 2.75 mm, $n = 20$) with four or five per centimeter in each longitudinal row.

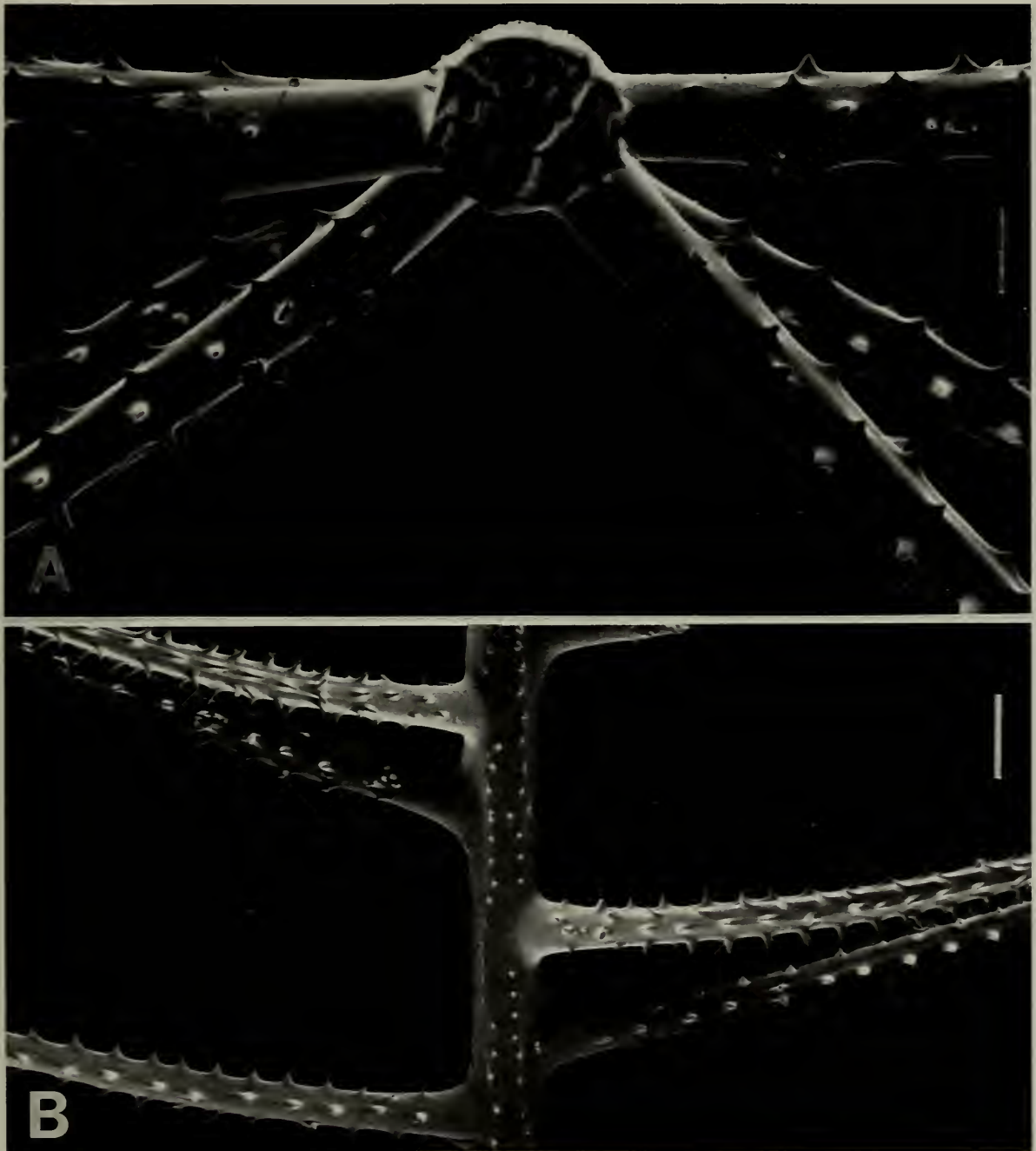


Fig. 2. A–B. *Sibopathes macrospina*, holotype, USNM 91417. A, Cross sectional view of branchlet showing arrangement of pinnules around axis; scale equals 0.2 mm. B, Frontal (polypar) view of branchlet showing arrangement of pinnules; scale equals 0.4 mm.

Pinnules in lateral rows arranged alternately; anterolateral pinnules placed 0.4–0.7 mm above (distal to) adjacent lateral pinnule. Overall, pinnules form alternating pairs, each consisting of one lateral and one slightly higher anterolateral member (Fig. 2B). Lateral pinnules 0.9–1.9 cm long (mean 1.36 cm, $n = 14$) and 0.20–0.32 mm in diameter (near base). Axial canal of pinnules 0.06–0.08 mm in diameter. Pinnules project up-

ward slightly forming angle of 75° or more with branchlet. Anterolateral pinnules usually shorter, but occasionally as long as or longer than adjacent lateral pinnules. Adjacent pinnules from different branches anastomose near base of corallum.

Spines usually simple, but occasionally bifid; triangular, acute, and smooth-surfaced (Fig. 3); small and relatively undeveloped at tip of pinnules (Fig. 4B) but up

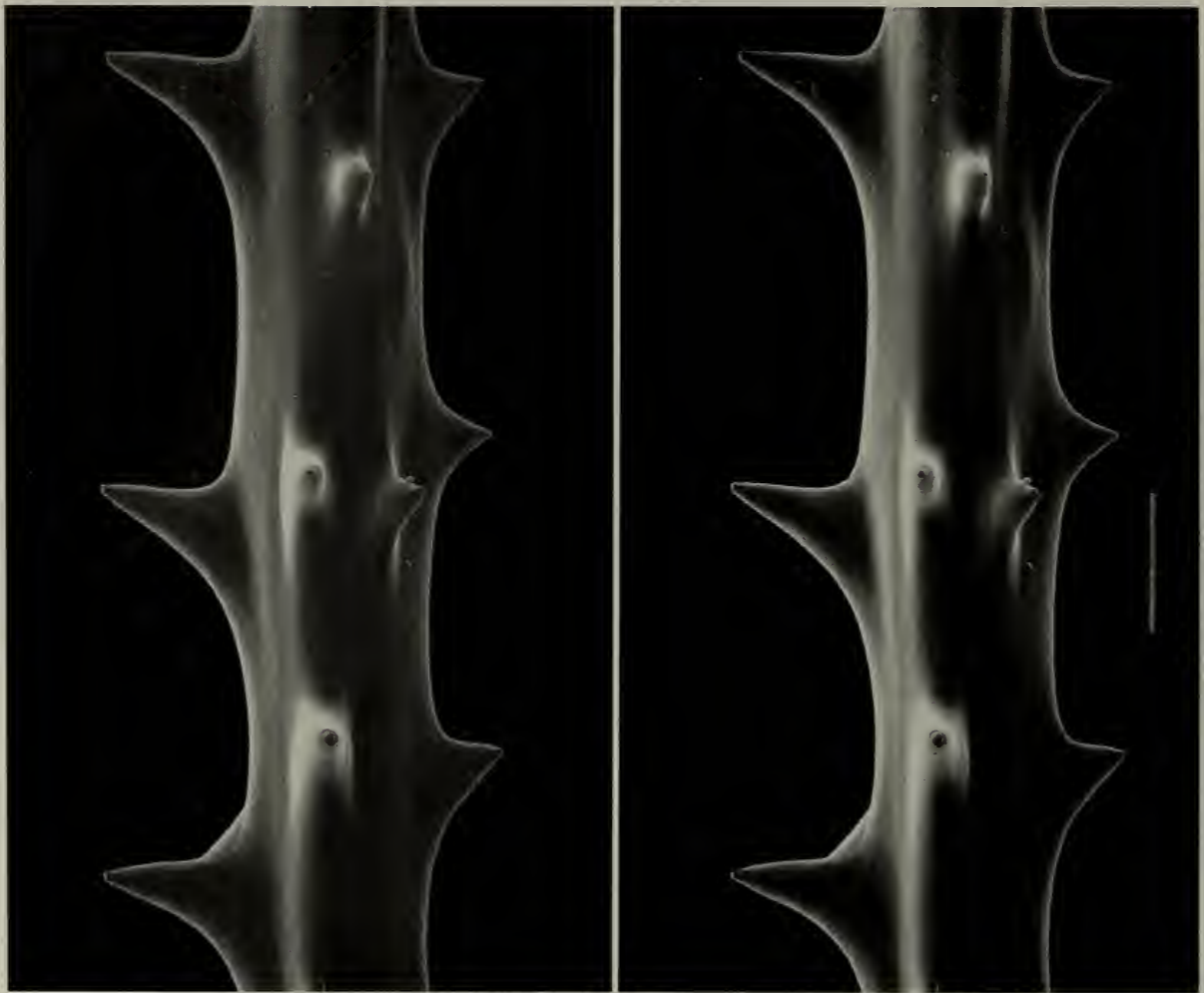


Fig. 3. *Sibopathes macrospina*, holotype, USNM 91417. Stereo SEM of pinnule with axial spines; scale equals 0.1 mm.

to 0.12 mm high (from midpoint of base to apex) on lower portion of pinnules (Fig. 4C). Spines unequally developed around circumference of pinnules; largest spines usually on front or polyp side of axis but, in places nearly equal in size on three sides, leaving abpolypar side with smallest spines. Polypar spines usually extending out perpendicular to pinnular axis, but occasionally directed distally or proximally. Abpolypar spines 0.02–0.05 mm high. Spines on stem and larger branches rarely more than 0.04 mm high. Spines on pinnules arranged in longitudinal rows; three to five rows visible in lateral view (excluding rows in which spines only partially visible). Distance between adjacent spines in each row 0.20–0.36 mm; generally from four to six spines per millimeter in each row.

Polyps elongated along transverse axis;

distance from distal edge of distal lateral tentacles to proximal edge of proximal lateral tentacles 1.8–2.3 mm (Fig. 4A). Polyps arranged in a single row with about four polyps per centimeter; interpolypar space 0.5–0.8 mm. Peristomal folds absent. Oral cone usually elongated transversely 0.28–0.44 mm; sagittal diameter 0.14–0.28 mm. Tentacles 0.12–0.25 mm in length. Ova present in lateral sections of coelenteron (Fig. 4E). Polyps with only six rudimentary and incomplete mesenteries, no actinopharynx, and no evidence of mesogloal partitions separating coelenteron into central and lateral chambers.

Etymology.—The specific name is derived from the Latin “macro” and “spina” in reference to the relatively large spines on the pinnules.

Comparisons.—This species is very sim-

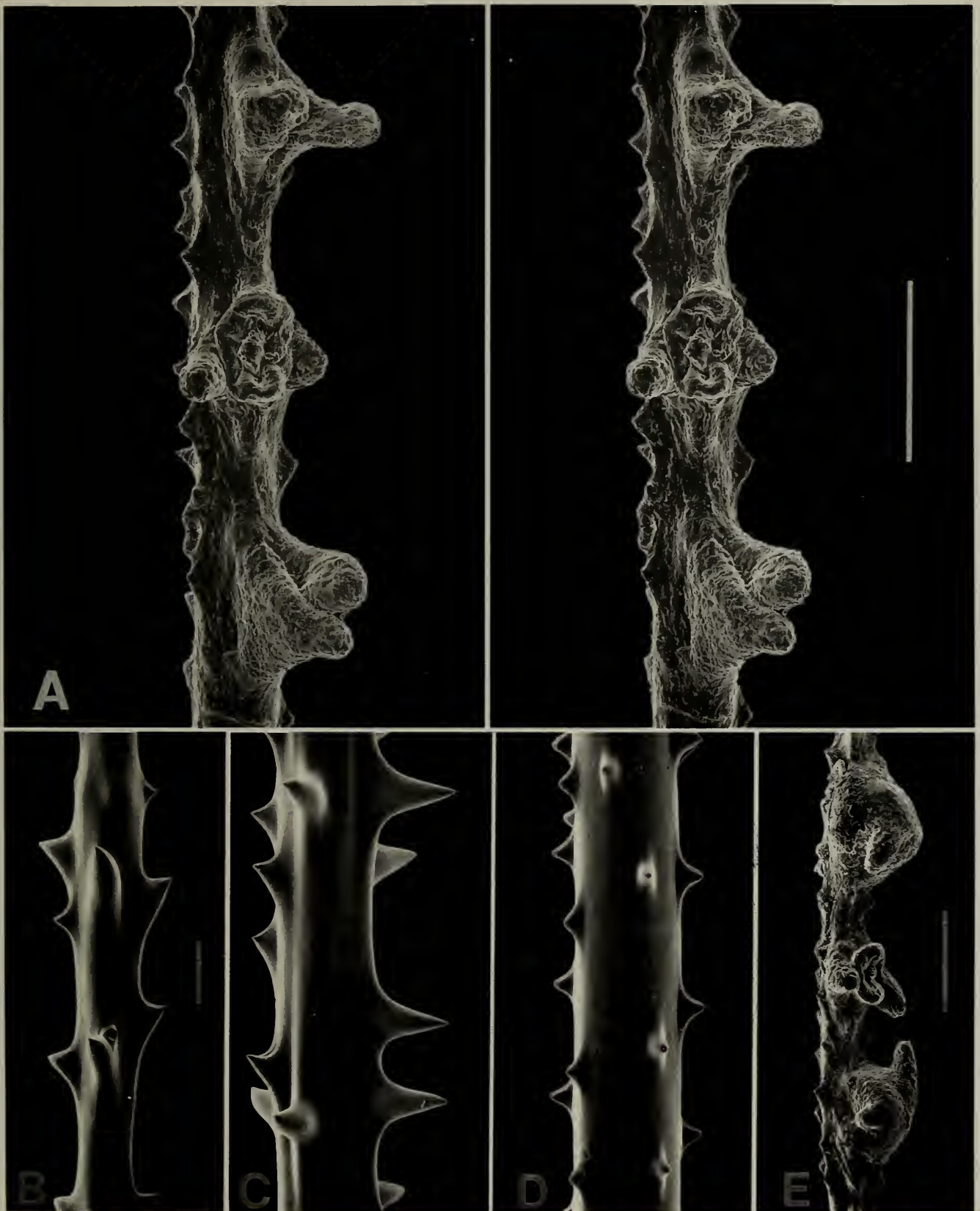


Fig. 4. A–C. *Sibopathes macrospina*, holotype, USNM 91417. A, Stereo SEM of polyp. B, Distal end of pinnule. C, Center of pinnule. D. *S. gephura* van Pesch, holotype, Siboga Stn. 280, center of pinnule. E. *S. macrospina*, holotype, USNM 91417, polyp with ova. Scale in A and E equals 0.5 mm; scale in B (also for C and D) equals 0.1 mm.

Table 1.—Morphometrics for *Sibopathes gephura* and *S. macrospina*.

Character	<i>S. gephura</i>	<i>S. macrospina</i>
Corallum		
Height (cm)	10	36
Basal stem diameter (mm)	~0.85	~2
Highest order of branching	1 ^a	4
Rows of pinnules	4 ^b –5	2–4 ^b
Pinnules		
Length of lateral pinnules (cm)	0.7–2.2	0.9–1.9
Basal diameter (mm)	0.22–0.28	0.20–0.32
Diameter of central canal (mm)	0.10–0.16	0.06–0.08
Distance apart in one row (mm)	2.2–3.0	1.8–3.5
Angle between lateral and anterior pinnules	45–90°	30–45°
Distal angle with stem	~60°	≥75°
Spines		
Height, polypar (mm)	0.03–0.04	0.07–0.12
Height, abpolypar (mm)	<0.03–0.04	0.02–0.05
Distance apart in one row (mm)	0.12–0.22	0.20–0.36
Average number per millimeter	5–7	4–6
Number of rows on pinnules (one view)	3–4	3–5
Polyps		
Length (mm)	2.0–2.5	1.8–2.3
Interpolypar space (mm)	0.5–1.1 ^c	0.5–0.8
Number per centimeter	3–3.5	3.5–4
Length of tentacles (mm)	≤0.5	0.12–0.25
Oral cone, transverse diameter (mm)	0.6–0.87 ^c	0.28–0.44
Oral cone, sagittal diameter (mm)	0.2	0.14–0.28

^a Specimen may only be a branch from a larger colony.

^b Most common condition.

^c Maximum value reported by van Pesch (1914).

ilar to *Sibopathes gephura* van Pesch (1914). Both species have a branched pinnulated corallum with simple pinnules arranged for the most part in four longitudinal rows. The major differences between the two species involve the orientation and arrangement of the pinnules and the size of the spines (Table 1). Pinnules on *S. gephura* appear somewhat less regular in length than those on *S. macrospina*, although in both cases they reach about the same maximum size of about 2 cm before becoming pinnulated branchlets. In *S. gephura* the pinnules tend to be more curved and more distally directed (relative to the branch), whereas in *S. macrospina* they are straight, stiff, and extend out more horizontally. The central axial canal in the

pinnules of *S. macrospina* is smaller in diameter than that in *S. gephura* (Table 1).

Van Pesch (1914) described the arrangement of the pinnules in *S. gephura* as being in four longitudinal rows, two lateral, one anterior, and one posterior; however, in re-examining the type specimen it was found that in places the rows are also arranged biserially, that is, with two rows on the right and two on the left. In such cases the pinnules are placed in alternating pairs with the front or anterolateral pinnule of each pair located slightly below the adjacent lateral (as viewed from the front or polyp-side of the corallum). This arrangement differs from that found in *S. macrospina* where the anterolaterals are placed slightly above the ad-

jacent laterals. Furthermore, on the holotype of *S. gephura* a few additional pinnules were found representing a fifth longitudinal row. These occurred in front of and slightly below the adjacent anterolateral pinnules such that each group of three pinnules formed a descending series going from the side to the front of the branch (as viewed from the polyp-side of the corallum). In contrast, in *S. macrospina* the pattern is reversed, with the pinnules in each group forming an ascending series (Fig. 2B).

In both species the spines are simple, triangular and acute; however, in *S. gephura* they measure not more than 0.04 mm in height (Fig. 4D), whereas in *S. macrospina* they attain a maximum size of 0.12 mm. In addition, the spines in *S. macrospina* are spaced farther apart than those in *S. gephura* (Table. 1). In both species the spines are largest on the side of the axis bearing the polyps; however, this is not easily seen in *S. gephura* because the abpolypar spines are only slightly smaller than the polypar spines.

There are no major differences in the external morphology of the polyps of the two species except that the polyps in *S. macrospina* are slightly smaller and closer together and have shorter tentacles than those in *S. gephura* (Table 1). These differences are not very great and may be due, in part, to state of preservation. In both species the polyps are arranged in a single row; on the upper side of the pinnules in *S. gephura*, and on the upper and occasionally front and lower sides of the pinnules in *S. macrospina*. In neither species is there any sign of peristomal folds dividing the polyps into central and lateral sections.

Although the specimen of *S. macrospina* was not originally fixed for histological examination, several polyps were removed from the corallum, sectioned, stained, and examined microscopically. Internal features of the polyp were difficult to distinguish because of the poor condition of the tissue; however, as in the case of *S. gephura*, there

was no sign of an actinopharynx, and the mesenteries were rudimentary and appeared to be no more than six in number. In addition, there was no indication of mesogoeal septa separating the coelenteron into central and lateral chambers. Van Pesch reported the same condition in *S. gephura*. Although nematocysts could not be seen in the polyps of *S. macrospina*, they were reported as occurring in batteries on the tentacles of *S. gephura* polyps (van Pesch 1914).

Discussion

The two species of *Sibopathes* differ from all other antipatharians in that the polyps lack an actinopharynx and, consequently, the six mesenteries are incomplete. Van Pesch (1914) created the subfamily Homoeotaeniales to contain *Sibopathes* and a second genus *Cladopathes* Brook, whose polyps also have only six mesenteries; however, in *Cladopathes* the mesenteries are attached to a well-developed actinopharynx. *Cladopathes* was originally included with *Schizopathes*, *Bathypathes*, and *Taxipathes*, in the subfamily Schizopathinae by Brook (1889). Polyps in the latter three genera have ten mesenteries, six primary and four secondary. In establishing the Schizopathinae, Brook considered the number of mesenteries to be of secondary importance when compared to the transverse elongation of the polyps into what he interpreted as "dimorphic" structures consisting of "gastrozooids" and "gonozooids." In describing the polyps of *Schizopathes*, Brook reported that the "zooids" were isolated from one another externally by peristomal folds and internally by mesogloeal partitions extending down from the upper, interior surface of the coelenteron. These features were not specifically described for other genera in the subfamily, and Brook's own illustrations indicate that peristomal folds are not typical of *Bathypathes* or *Taxipathes* polyps. Consequently, the only remaining diagnostic character of the Schizopathinae is the ex-

treme transverse elongation of the polyp. In 1896, Schultze proposed a new classification of the Antipathidae based on the number of mesenteries, rather than on the presumed dimorphism of the polyps. He therefore established a separate subfamily, the Hexamerota for *Cladopathes*. The subfamily was renamed the Cladopathinae by Kinoshita in 1910, who added to it a new monotypic genus *Hexapathes*. The polyps of *H. heterosticha* reportedly contain an actinopharynx, six complete primary mesenteries and no secondaries; however, the skeletal morphology is quite different from that of *Cladopathes* (and *Sibopathes*); instead, it is similar to that of species of *Bathypathes*. Thus, van Pesch's Homoeotaeniales is equivalent to the Cladopathinae and contains those genera having polyps with six mesenteries, but in which an actinopharynx may be present (*Cladopathes* and *Hexapathes*) or absent (*Sibopathes*).

In describing *Sibopathes gephura*, van Pesch (1914) noted that many of the anatomical features of the polyps were suggestive of a very primitive condition. These features included: absence of an actinopharynx and secondary mesenteries; small size of the sagittal mesenteries and their occurrence only near the base of sagittal tentacles; thinness of the mesogloea; presence of epidermally derived cells within the mesogloea; very wide connection between the axis epithelium and the body wall; occurrence of deeply staining gland cells throughout the gastrodermis; and absence of mesenteric filaments (defined by van Pesch as extensions of the mesenteries at the aboral edge of the actinopharynx). Furthermore, van Pesch noted that the transverse mesenteries disappeared at the junction of the central and lateral parts of the polyp, but reappeared, with a club-shaped edge, in the lateral chambers. Van Pesch did not consider the club-shaped edge of the transverse mesenteries to represent a mesenteric filament.

If Schultze's classification is followed, it could be argued that the absence of an actinopharynx and the presence of other primitive characters would warrant the taxonomic recognition of *Sibopathes* at least at the same level as the Cladopathinae, and perhaps even at the family level (with the recent removal of the Dendrobrachiidae, the order currently contains only the single family Antipathidae, see Opresko & Bayer 1991). However, if one considers the possibility that the characters of *Sibopathes* are secondarily derived as a result of the extreme transverse elongation of the polyp (a character which in itself would be difficult to view as a primitive state), and if one evaluates overall similarities in external morphology, then it might be argued that *Sibopathes* is indeed related to *Cladopathes* but not to *Hexapathes*. Like *Sibopathes*, *Cladopathes* is quasi-sympodial (i.e., without a single continuous stem), multi-branched, and pinnulated. The pinnules are simple or forked and arranged in three or four longitudinal rows "showing a subspiral arrangement." In contrast, *Hexapathes heterosticha* Kinoshita is clearly monopodial with two rows of lateral pinnules and one row of anterior pinnules, a pattern identical to that occurring in *Bathypathes lyra* Brook.

Sibopathes and *Cladopathes* also show external similarities to the genera *Taxipathes* and *Parantipathes*. All four genera (*Sibopathes*, *Taxipathes*, *Parantipathes*, and *Cladopathes*) have transversely elongated polyps of relatively small size (generally <3 mm). In contrast, the polyps of *Hexapathes heterosticha* were described as being 5–9 mm long, and this is also the case for some species of *Bathypathes*. *Taxipathes* and *Parantipathes* also have pinnules arranged in longitudinal rows and alternating semispiral groupings, but they differ from *Sibopathes* and *Cladopathes* in having secondary mesenteries in the polyps. However, this difference is certainly not as significant as that separating *Sibopathes* from *Cladopathes*

(i.e., the absence of an actinopharynx). Further analysis may eventually show that these four genera form a natural assemblage.

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Health and Safety Research Division, Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, Tennessee 37831-6050, U.S.A.